appropriate U.S. form and delete the multiple dependent claims in this application, and thereby eliminate excessive claim fees. Such amendments are formal in nature and no new matter is added by any of the above amendments. A Substitute Specification is enclosed to reflect these amendments. Entry of this amendment and early examination of this application are respectfully solicited.

Respectfully submitted,

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(Date)

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SUBSTITUTE SPECIFICATION

#5

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~~MONTAPLAST GMBH}~~ **[TITLE OF THE INVENTION]**

~~{51597 Morsbach}~~ **[Manufacturing Process for a Plastic Injection Molding Laminated with Textile Fabric, Non-Woven or the Like]**

~~{Manufacturing process for a plastic injection moulding laminated with a textile fabric, a non-woven or the like}~~ **[BACKGROUND OF THE INVENTION]**

[0001]The invention relates to a manufacturing process for a plastic injection ~~{moulding}~~ **[molding]** laminated with a textile fabric, a non-woven or the like, and a textile fabric, a non-woven or the like for laminating and permanent joining to a piece of plastic interior trim of any shape, particularly for the automotive sector.

[0002]Polyester or blended fabrics are preferably used as the textile fabrics and permanently applied to the injection ~~{moulding}~~ **[molding]** as cladding. These materials are usually textile fabrics laminated with a non-woven. It is known from the prior art that these laminated textile fabrics are initially cut to size and the blank then placed inside the injection ~~{mould}~~ **[mold]**. In order to obtain a wrinkle-free surface, the fabric must be tension-mounted inside the injection ~~{mould}~~ **[mold]**. This is preferably achieved using a pneumatically actuated clamp system. After tension-mounting the fabric - a relatively time-consuming process - a backing is then injection ~~{moulded}~~ **[molded]** onto it. After the injection process ends, the semi-finished workpiece, such as a column trim panel for the passenger car sector, is ejected and conveyed to the trimming station. In the trimming station, the fabric protruding over the edge of the workpiece must be trimmed in order to obtain the finished workpiece.

[0003]The workpieces are generally of three-dimensional geometry, meaning that the edge contour is also three-dimensional. According to the prior art, trimming requires an article-~~{speci fic}~~ **[specific]** trimming cell, which can process the respective edge contour of the workpiece. The throughput time of an individual workpiece is decisively dependent on the operating speed ~~{}~~of the injection ~~{moulding}~~ **[molding]** machine, as this is usually the bottleneck in the manufacturing process.

[0004]The invention is based on the technical problem of further developing a generic manufacturing process such that the throughput times are reduced.

[BRIEF SUMMARY OF THE INVENTION]

[0005]According to the invention, the object is solved in that the manufacturing process comprises the following steps:

- Preforming of a fabric blank, which is coated on a first side facing the injection ~~{moulding}~~ **[molding]** with a plastic film that is thermoformable and, when cooled, dimensionally stable and elastic, into the desired outer contour of the injection ~~{moulding}~~ **[molding]** to be manufactured.
- Insertion of the preformed fabric blank into the injection ~~{mould}~~ **[mold]**,
- Injection-backing of the fabric blank with plastic, and
- Ejection of the laminated injection ~~{moulding}~~ **[molding]**.

[0006]Prior to the start of the actual injection ~~{moulding}~~ **[molding]** process, the fabric blanks are consequently already given the prefabricated contour they need to cover the finished injection ~~{moulding}~~ **[molding]**. In contrast to the prior art, a first side of the fabric on the inside of the finished product is provided with a thermoformable plastic. In the first process step, the fabric blank is thermoformed in a corresponding ~~{mould}~~ **[mold]**, in order to obtain the desired outer contour of the later injection ~~{moulding}~~ **[molding]**. This plastic is dimensionally stable after cooling. At the same time, however, it is still so elastic that a bend can be formed with the fabric on the workpiece.

[0007]Contour trimming can be carried out after the preformed textile blanks cool. This can be done by an automatic machine, such as an articulated robot. This makes it possible to ~~{realise}~~ **[realize]** the three-dimensional contour trimming of the edge profile that is particularly common on interior trim in the automotive sector and cannot be ~~{realised}~~ **[realized]** with the simple thermoforming process step alone; in the case of thermoforming, trimming can only achieve a two-dimensional edge cut.

[0008]After contour trimming, the preformed fabric is inserted into the injection ~~{mould}~~ **[mold]**. The plastic film is impermeable to air, meaning that the fabric can also be handled from the fabric side by the suction grippers usually used in injection ~~{moulds}~~ **[molds]**, in order to be inserted into the injection ~~{mould}~~ **[mold]** or removed ~~{it}~~ from it. Thus, the usual

automatic machines or robots can be used for handling in the process according to the invention without refitting.

[0009]The preformed fabric is injection-backed with plastic in the injection ~~{mould}~~ **[mold]** in the familiar manner. During injection ~~{moulding}~~ **[molding]**, the injected plastic is permanently joined to the plastic film already provided on the fabric.

[0010]After injection ~~{moulding}~~ **[molding]**, the laminated workpiece is removed from the injection ~~{mould}~~ **[mold]** and ejected. Accordingly, no further trimming of the workpiece is required. This initially makes continuous manufacturing possible, as the process is no longer dependent on the cycle times of the injection ~~{mould}~~ **[mold]**. In addition, article-specific trimming cells are unnecessary, this substantially reducing the space required for the manufacturing process. Furthermore, the fabric blanks are easy to handle, thus making it possible to ~~{realise}~~ **[realize]** far higher capacity ~~{utilisation}~~ **[utilization]**.

[0011]The preformed fabric blank is preferably first cut to fit the outer contour of the finished workpiece. This can be carried out by a trimming robot, for example. The article-specific trimming cells of the prior art thus become obsolete. The trimming robots can carry out any required trimming.

[0012]According to the invention, the plastic film is made of materials that can be joined particularly well with the plastic to be injected later on. Thermoplastic olefins, variants thereof, or thermoplastic urethanes are preferred for use.

[0013]Alternatively, the surface of the film facing the fabric can also be coated with an activator that permanently joins the fabric to the injected plastic and also simplifies and accelerates the joining process.

[0014]The thickness of the laminated fabric is usually about 5 mm and that of the plastic film about 2 mm. Depending on the application, the latter dimensions can also be thicker if complicated contours have to be reproduced.

~~{An example of the invention is shown in the drawing and described below in detail on the basis of the figures. The figures show the following:}~~ **[BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS]**

[0015]~~{Fig. 1 A}~~ **[The foregoing summary, as well as the following detailed description of the invention, will be better understood when read in conjunction with the appended drawings. For the purpose of illustrating the invention, there is shown in the drawings an**

embodiment which is presently preferred. It should be understood, however, that the invention is not limited to the precise arrangements and instrumentalities shown.

[0016]**In the drawings:**

[0017]**Fig. 1 is a]** schematic top view of the manufacturing process according to the invention~~{,}~~**[;]** and

[0018]Fig. 2 ~~{A}~~ **[is a]** lateral cross-section of the textile fabric ~~{accor ding}~~ **[according]** to the invention.

[DETAILED DESCRIPTION OF THE INVENTION]

[0019]Figure 1 shows a top view of the manufacturing process according to the invention. According to the drawing, the process essentially consists of two elements, namely thermoforming station 1 and injection ~~{moulding}~~ **[molding]** station 2.

[0020]According to the process ~~{according to}~~ **[of]** the invention, laminated fabric 3, which is delivered in prefabricated form and provided with the plastic film on one side, is delivered in rolls and unrolled on thermoforming station 1. A thermoforming device, which is preferably designed as automatic thermoforming machine 4, preforms the fabric into preformed fabric blanks 5.

[0021]Trimming robots 6 and 7 cut fabric blanks 5 to the final ~~{}~~outer contour they will have on the finished workpiece. In this case, trimming robots 6 and 7 are designed as articulated robots.

[0022]The preformed and trimmed preforms are then conveyed to an intermediate buffer 8. The individual fabric blanks 5 are conveyed from this intermediate buffer 8 by another automatic machine, which is preferably designed as a linear robot 9 due to the required precision, to the actual injection ~~{moulding}~~ **[molding]** process in injection ~~{moulding}~~ **[molding]** machine 10. After injection ~~{moulding}~~ **[molding]**, the laminated workpieces are ejected from injection ~~{mould}~~ **[mold]** 10 by articulated robot 9 and forwarded to assembly.

[0023]Figure 2 shows a lateral view of a fabric blank 5 shortly after thermoforming. Thermoforming is carried out in an automatic thermoforming machine 4, which consists in the known fashion of a bottom force 4a and a top force 4b. Heat is applied to the top force and, when bottom force 4a and top force 4b are pressed together, it thermoforms plastic film 5a provided on fabric blank 5.

[0024]Plastic film 5a lies on the bottom force. Vacuum ducts 4c are also provided on bottom force 4a. Fabric blank 5 consists of a plastic film 5a lying on bottom force 4a, the underside of which is joined to a textile fabric **[5b]** laminated with a non-woven.

[0025]After preforming, fabric blank 5 has a three-dimensional, shell-type shape. The flange-like edge 5c around the outside can either be removed during contour trimming or folded in towards the inside of the finished workpiece, if a workpiece with a fold is to be manufactured.

[0026]~~{Manufacturing process for a plastic injection moulding lami nated with a textile fabric, a non-woven or the like}~~ **[It will be appreciated by those skilled in the art that changes could be made to the embodiments described above without departing from the broad inventive concept thereof. It is understood, therefore, that this invention is not limited to the particular embodiments disclosed, but it is intended to cover modifications within the spirit and scope of the present invention as defined by the appended claims.]**

List of reference numbers

1	Thermoforming station
2	Injection ~~{moulding}~~ **[molding]** station
3	Textile fabric
4	Automatic thermoforming machine
4a	Bottom force
4b	Top force
4c	Vacuum ducts
5	Fabric blank
5a	Plastic film
5b	Textile fabric
5c	Edge
6	Trimming robot
7	Trimming robot
8	Intermediate buffer
9	Articulated robot
10	Injection ~~{moulding machine}~~ **[mold]**

~~{Manufacturing}~~ **[CLAIMS**

We claim:

1. **A manufacturing]** process for a plastic injection **[molding laminated with a fabric, the process comprising the following steps: preforming a fabric blank into a desired outer contour of the injection molding to be manufactured, the blank being]** ~~{moulding lami nated with a textile fabric, a non-woven or the like~~

~~Patent claims~~

~~1. Manufacturing process for a plastic injection moulding laminated with a textile fabric, a non-woven or the like, particularly a piece of interior trim for an automobile, that comprises the following process steps: preforming of a fabric blank, which is}~~ coated on a first side facing the injection ~~{moulding}~~ **[molding]** with a plastic film that is thermoformable and, when cooled, dimensionally stable and elastic~~{, into the desired outer contour of the injection moulding to be manufactured; insertion of}~~**[; inserting]** the preformed fabric blank into ~~{the}~~ **[an]** injection ~~{mould}~~ **[mold]**; injection-backing ~~{of}~~ the fabric blank with plastic; ~~{ejection of}~~ **[and ejecting]** the laminated injection ~~{moulding.}~~ **[molding.]**

2. ~~{Manufacturing}~~ **[The manufacturing]** process ~~{as per Claim 1, where}~~ **[according to claim 1, wherein the]** preforming **[step]** is followed by **[trimming the fabric blank to a]** true-to-size contour ~~{trimming.}~~**[.]**

~~{3. Manufacturing process as per Claim 1 or 2, where the work pieces}~~ **[3. The manufacturing process according to claim 1, wherein workpieces]** are exclusively handled by automatic machines between ~~{the}~~ individual process steps.

4. ~~{Manufacturing process as per one of Claims 1 to 3, where the}~~ **[The manufacturing process according to claim 1, wherein an]** edge of the injection ~~{moulding}~~ **[molding]** has a contour of any shape~~{, even}~~**[.**

5. **The manufacturing process according to claim 4, wherein the shape is]** three-dimensional.

[6. The manufacturing process according to claim 1, wherein the injection molding is a piece of interior trim for an automobile.

7. A textile] ~~{5. Textile}~~ fabric for laminating and permanent joining to a piece of plastic interior trim of any shape, ~~{particularly for the automotive sector, c h a r a c t e r i s e d i n t h a t the fabric is}~~ **[comprising a fabric]**joined on one side to a plastic film (5a) that is thermoformable and, when cooled, ~~{~~

~~}~~dimensionally stable and elastic.

~~{6. Textile fabric as per Claim 5, c h a r a c t e r i s e d i n t h a t the}~~ **[8. The textile fabric according to claim 7, wherein a]**surface of the plastic film (5a) facing the fabric is coated with an activator that permanently joins the fabric to the plastic to be used for injection-backing.

~~{Manufacturing process for a plastic injection moulding lami nated with a textile fabric, a non-woven or the like}~~ **[9. The textile fabric according to claim 7, wherein the trim is for use in an automotive sector.]**

~~{Summary}~~ [ABSTRACT OF THE DISLCOSURE]

In order to reduce the throughput times of a manufacturing process and the space required for the manufacturing facilities for a plastic injection ~~{moulding}~~ **[molding]** that is laminated with a textile fabric, a non-woven or the like, particularly a piece of interior trim for an automobile, ~~{it is proposed in accordance with the invention that the process comprise}~~ **[a process is provided comprising]** the following steps: loading of a fabric blank, which is coated on a first side facing the injection ~~{moulding}~~ **[molding]** with a plastic film that is thermoformable and, when cooled, dimensionally stable and elastic; preforming ~~{of}~~ the fabric blank into the desired outer contour of the injection ~~{moulding}~~ **[molding]** to be manufactured; ~~{insertion of}~~ **[inserting]** the preformed fabric blank into the injection ~~{mould}~~ **[mold]**; injection-backing ~~{of}~~ the fabric blank with plastic; ~~{ejection of}~~ **[and ejecting]** the laminated injection ~~{moulding (Fig. 1)}~~ **[molding]**.